Space Weather Technical Forecast

Issued on Wednesday, 04 May 2022 at 01:25 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

Space Weather Forecast Headline: No significant geomagnetic activity. Likely increasing chance of R1-R2 blackouts, with a slight chance of R3 blackouts from region transiting southeastern limb.

Analysis of Space Weather Activity over past 24 hours
Solar Activity: Solar activity has been High, due to an X1.1 flare at 03/1325UTC from a region just crossing the southeast limb. This region is currently presenting as mainly plage, but is the return of ex-2992, a previously active region, which suggests a risk of developing further complexity. Region 3004 (Dai/Beta) close to south-centre disc has increased in complexity but has not yet produced significant activity. No Earth-directed CMEs have been observed in the last 24 hours.

Solar Wind / Geomagnetic Activity: The solar wind, observed at L1, is around 400km/s as the solar wind returns to ambient conditions speeds, with density has below average. Total magnetic field strength, Bt, has been weak, with the north-south component also varying weakly. Phi angle was negative (towards the Sun) throughout, with geomagnetic activity Quiet.

Energetic Particles / Solar Radiation: The high energy proton flux (10 MeV) has been at background through the last 24 hours. The high energy electron flux has varied between moderate and high levels, reaching a peak of 2320e3 pfu at 03/1440UTC. Electron fluence has followed a rising trend to exceed the Active threshold and was 1.01e8 integrated pfu at 03/2400UTC.

Four-Day Space Weather Forecast Summary
Solar Activity: Solar activity is expected to be Low, with an increasing chance of Moderate and a slight chance of High activity, due to the rotation of ex-2992 onto the southeast limb.

Solar Wind / Geomagnetic Activity: No Earth-directed CMEs are currently forecast. Solar wind speeds are now ambient, with no enhancements expected in the forecast period. Geomagnetic activity is expected to be mainly Quiet, with isolated Unsettled intervals.

Energetic Particles / Solar Radiation: The high energy proton flux (greater than 10 MeV) is at background and is expected to continue at this level through much of the period. The high energy electron flux (greater than 2MeV) is forecast to continue to exceed the high (1e3 pfu) threshold, but with slightly declining peaks each day. Electron fluence is likely to exceed the Active (1e8 integrated pfu) level on 04 May, with a decreasing trend through the remainder of the period.

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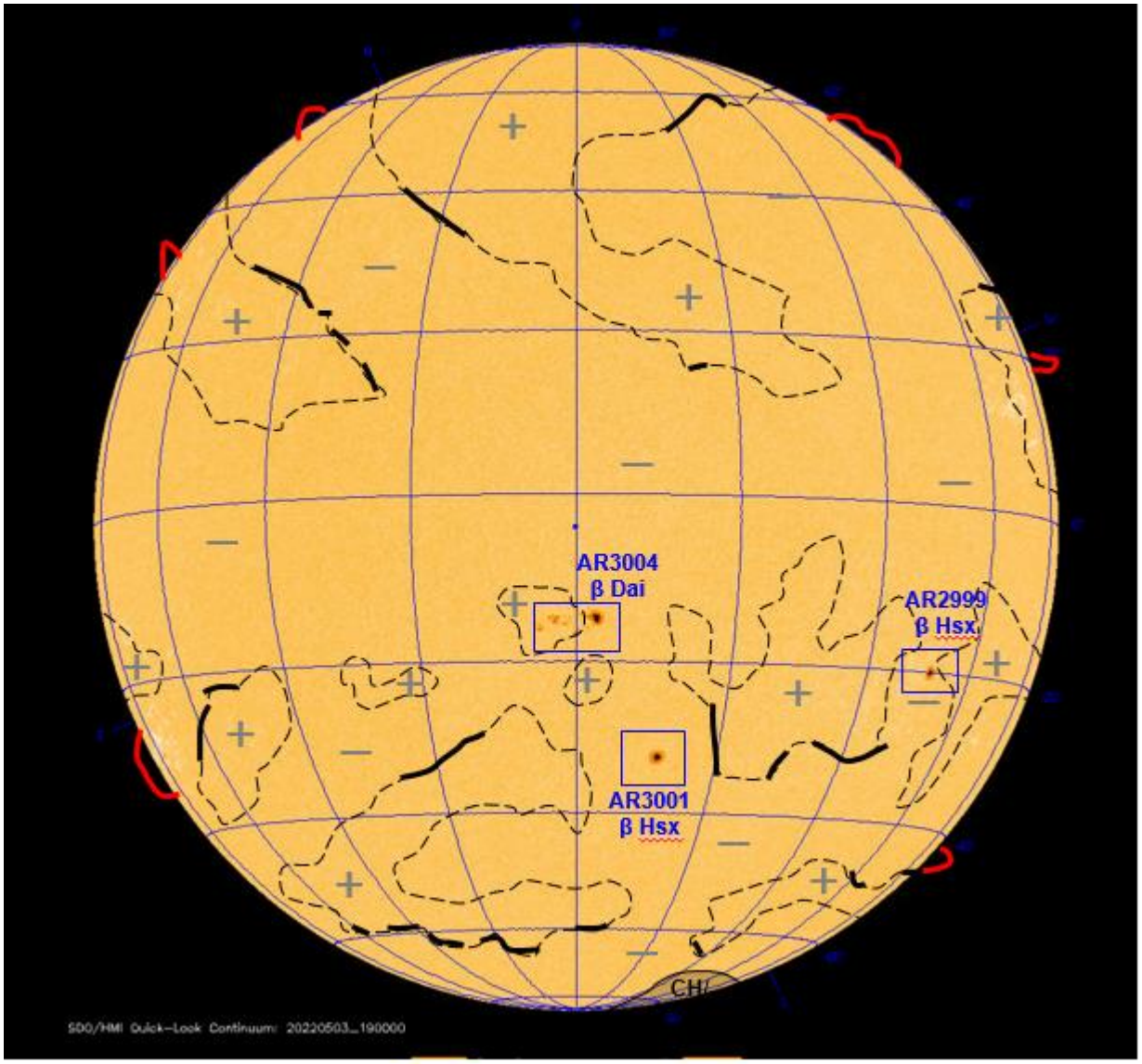
Figure 1. Solar Analysis Valid 03/2000UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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Geomagnetic Storms:
No Earth-directed CMEs are forecast through the next four days.

Solar winds are now at ambient levels as the high speed stream from coronal hole 78 has disconnected from the near-earth environment.

Geomagnetic activity is expected to be mainly Quiet, with isolated Unsettled intervals.

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	**G1 to G2**	No	1	1	1	1
Strong	**G3**	No	1	1	1	1
Severe	**G4**	No	1	1	1	1
Extreme	**G5**	No	1	1	1	1

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Radio Blackouts - X-Ray Flares:
Solar activity has been high, due to an X-flare from a region on the southeast limb. This is a return of ex-2992, an active region on the last rotation which produced an X2.2 flare. Although this region does not appear complex at present, the recent activity suggests that there is a significant magnetic potential within this region.

There are two simple alpha regions on the visible disc and one increasingly complex beta region in the south-centre disc. Based on the combination of risks there is a further chance of M-class flares with a slight chance of X-class flares, mainly from ex-2992.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	Yes	30	30	30	30
Very Active	R3 to R5 X Class	Yes	10	10	10	10

Figure 2: GOES 16 X-ray flux

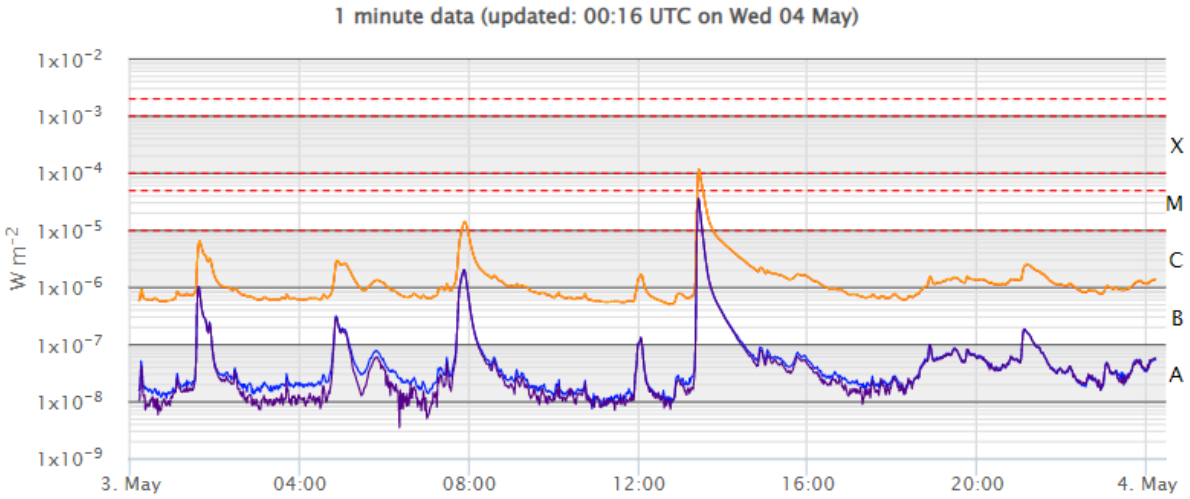

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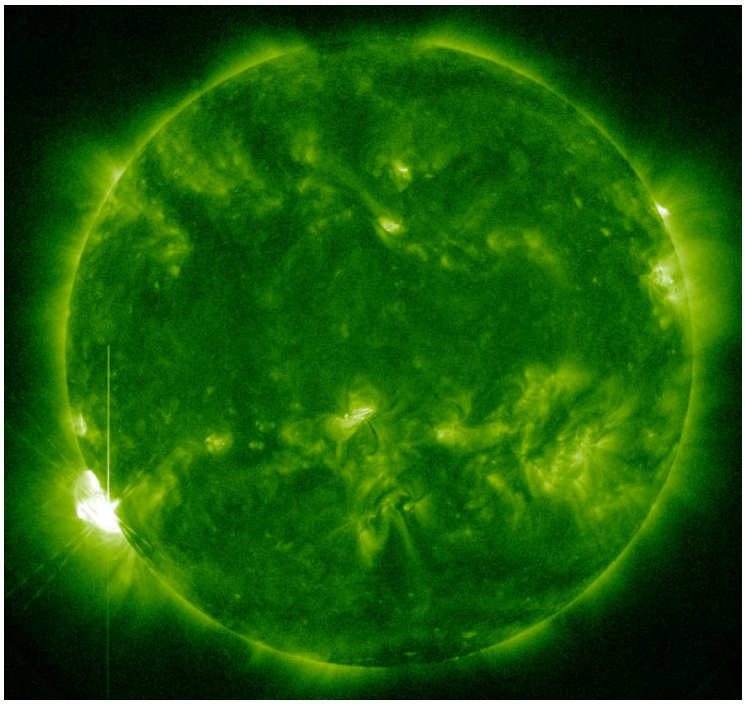
Figure 3: SDO AIA 94 imagery, at 03/1325UTC, with the flare in the southeast clearly visible.



Solar Radiation Storms - (High Energy Protons):

The high energy proton flux (greater than 10 MeV) as measured by GOES-16 at GEO is at background levels, and is most likely to remain so through the next four days. The region on the southeast limb is the most likely candidate to produce proton storms, but the current position in the eastern hemisphere is unfavourable for an Earth-directed eruption.

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	1	1	1	1
Very Active	**≥ S3 ***	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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High Energy Electrons Event (≥ 2MeV):
High energy electron flux (greater than 2MeV) is expected to vary between moderate and high levels through the next four days, due to the input into the belts from the recent high speed stream. There is likely to be a slight decrease in the diurnal highs, but with peaks still above the high threshold through the next four days.

Electron fluence has followed a rising trend during the last 24 hours in response to the high fluence, with this expected to remain above the Active (1e8 integrated pfu) threshold for much of 04 May, followed by a decline through the period.

GEO Electron Environment Probability (Exceedance)	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ 2 MeV ≥ $1x10^8$**	No	100	40	20	20
Very Active	**≥ 2 MeV ≥ $1x10^9$**	No	1	1	1	1

Figure 4: GOES 16 electron flux

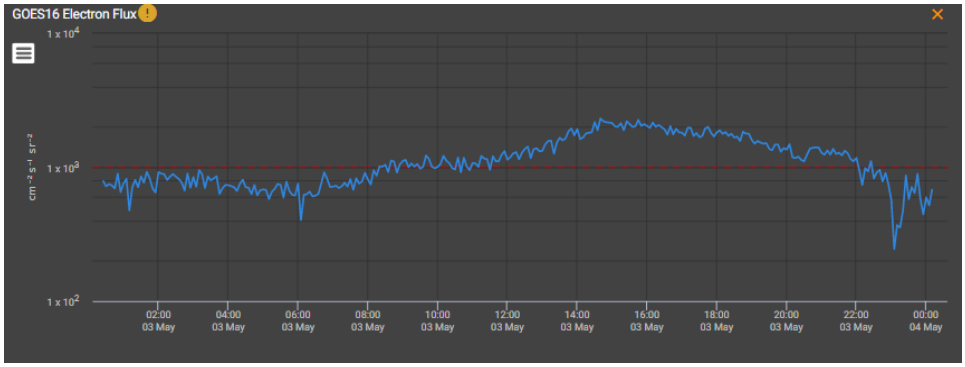
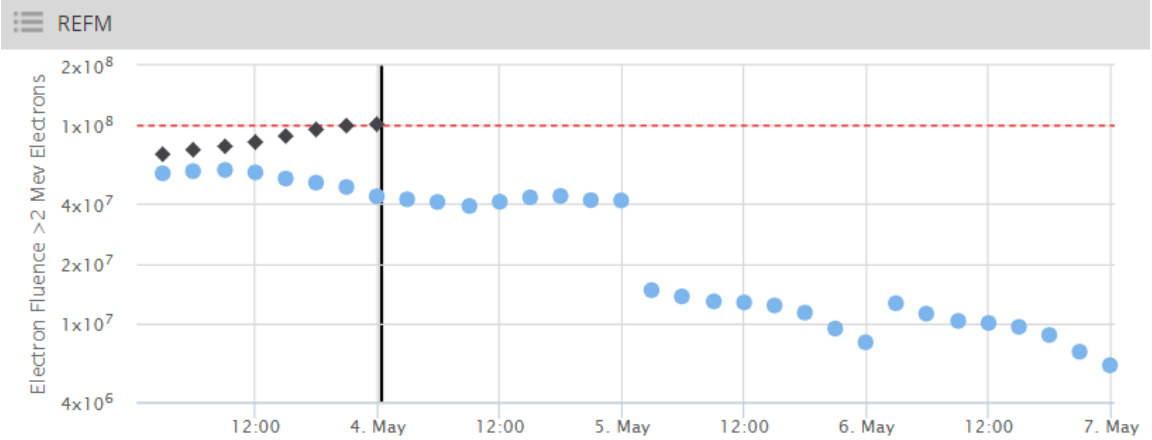


Figure 5: MOSWOC REFM electron fluence model



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